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Comparison of MODTRAN 4.x Modeled Radiance with AVIRIS Measured Radiance in the Solar Reflected Spectrum

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focus of talk

- description of AVIRIS instrument
  - imaging spectrometer
- in-flight radiometric cal technique
  - implications for MODTRAN
- results using MODTRAN3
- results using MODTRAN4
- analysis and comparison

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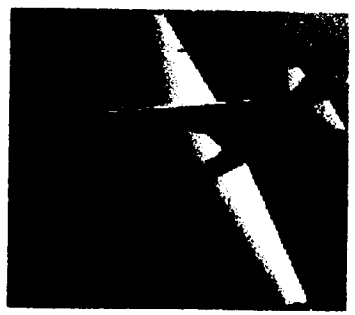
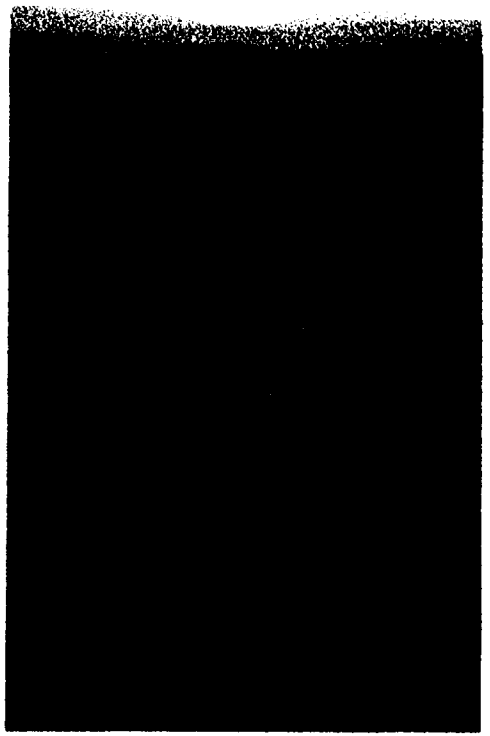
AVIRIS instrument

- imaging spectrometer on ER-2 platform
- 224 channels between 370 and 2500nm (~ 10nm resolution)
- sufficient resolution to examine MODTRAN's modeling of some gas absorptions in the solar reflected spectrum



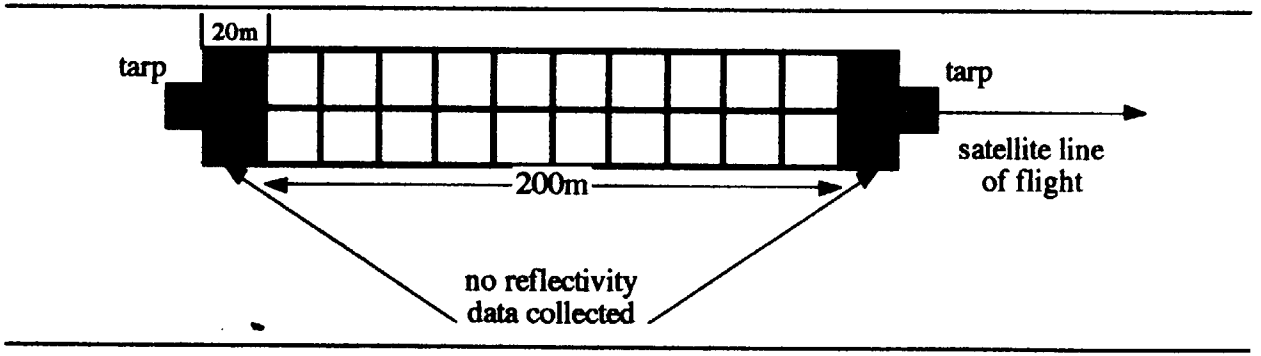
sites for radiometric calibration

- large extent
  - several km in dimension
- bright
  - 40% reflectivity typical of playas
- spectrally "flat"
- spatially homogeneous



in-flight radiometric calibration

- choose homogeneous region of playa
- measure reflectance of playa with portable spectrometer in target area
- locate target region in AVIRIS image
- **correct AVIRIS data for atmospheric effects to derive reflectance**
- compare results from two techniques



deriving reflectance

- from ASD spectroradiometer data
  - $\rho_{ASD} = \rho_{Spectralon} \cdot \frac{DN(playa)}{DN\ (Spectralon)}$
- from AVIRIS data
  - sun photometer instrument:visibility
  - iterate MODTRAN to get water vapor
  - $\rho_{AVIRIS} = \frac{radiance_{AVIRIS} - radiance(\rho = 0)_{MODTRAN}}{radiance(\rho = 1)_{MODTRAN} - radiance(\rho = 0)_{MODTRAN}}$
- two radiance values compared

MODTRAN inputs

- 60km visibility, 23km rural aerosols
- MLS atmosphere, 11% scaled H_2O
- no clouds
- 20km sensor altitude, nadir-looking
- 0.8km playa surface altitude
- calculated at $5cm^{-1}$ spacing
- convolved to 10nm AVIRIS SRF

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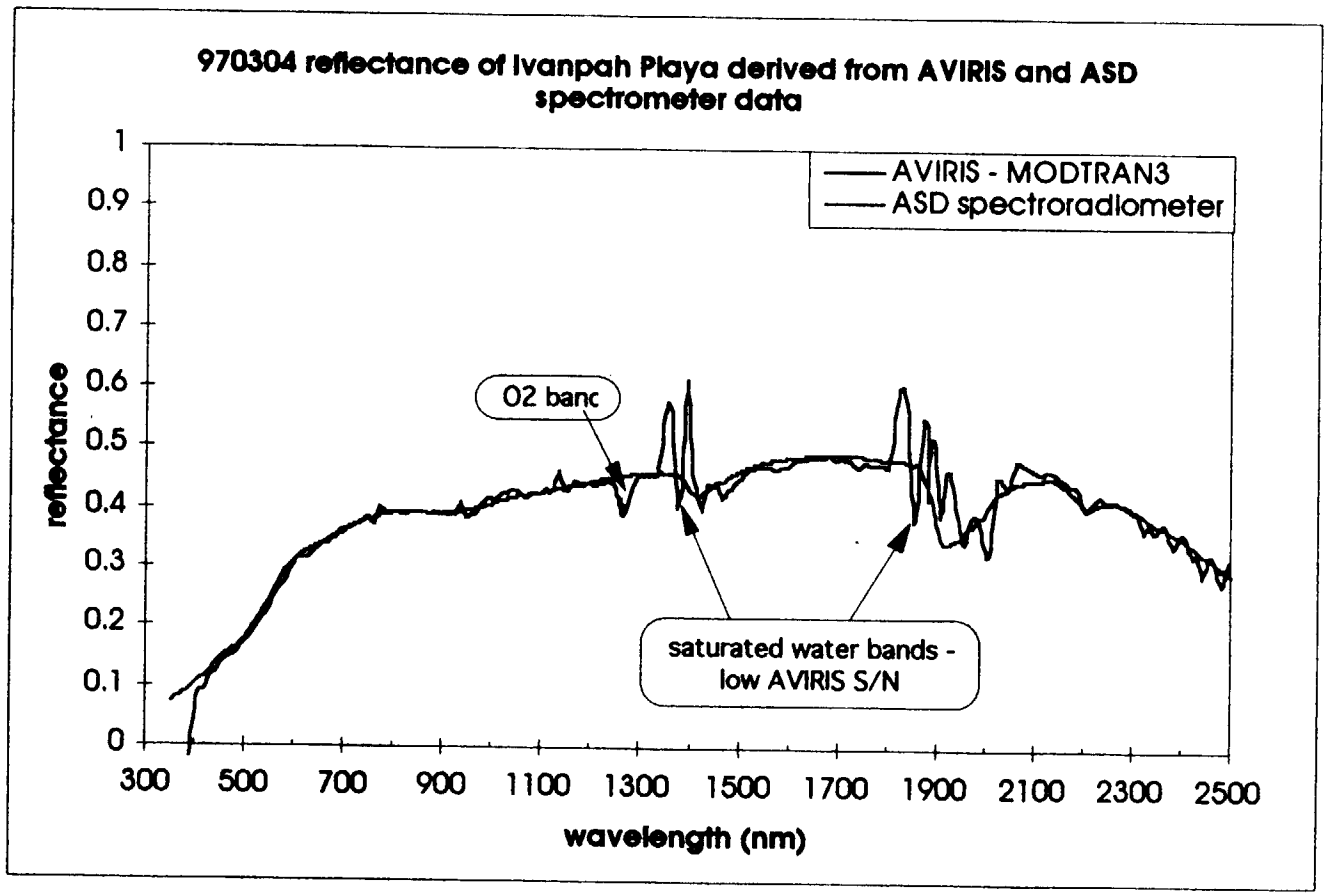
results using MODTRAN3



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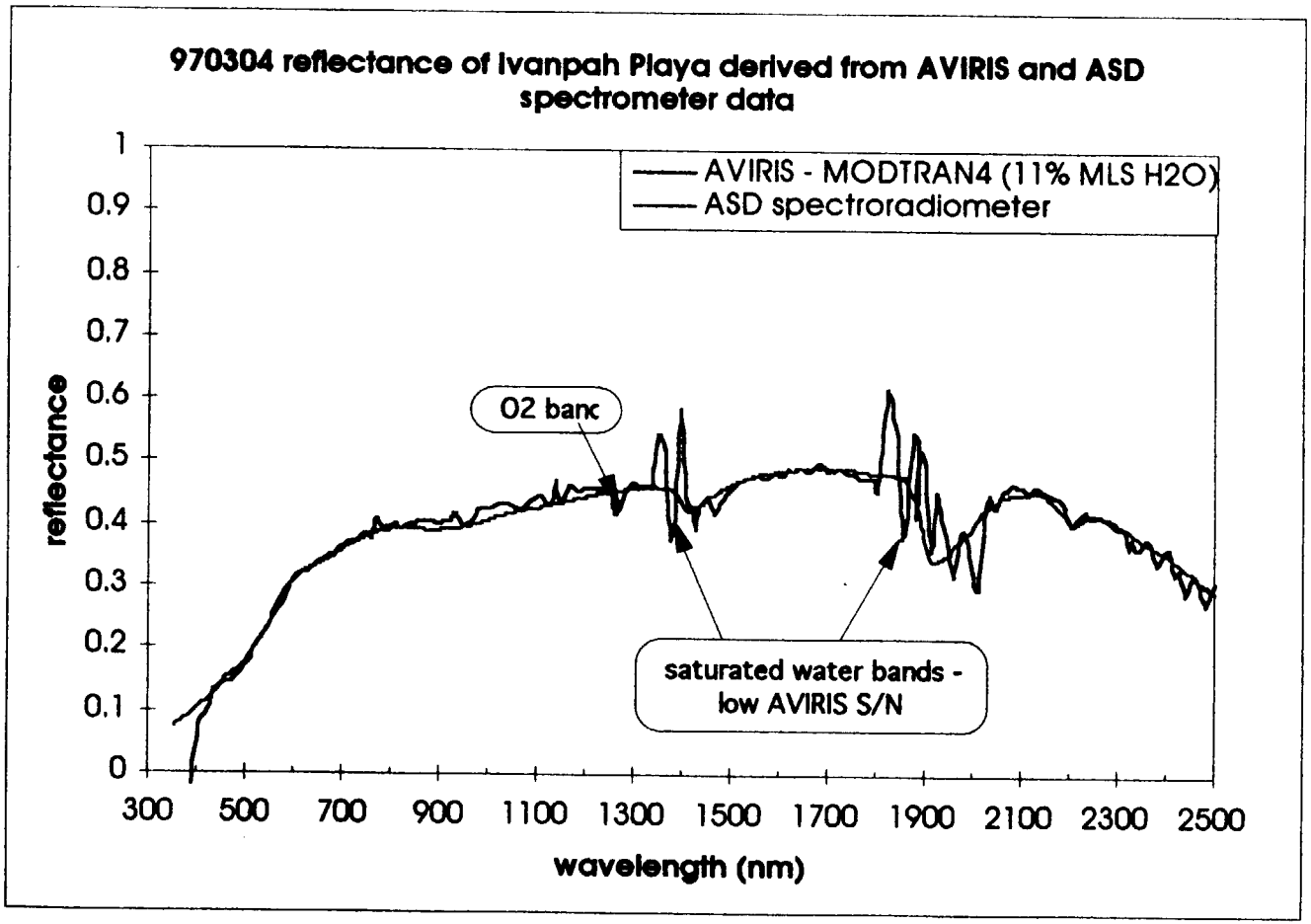
results using MODTRAN4



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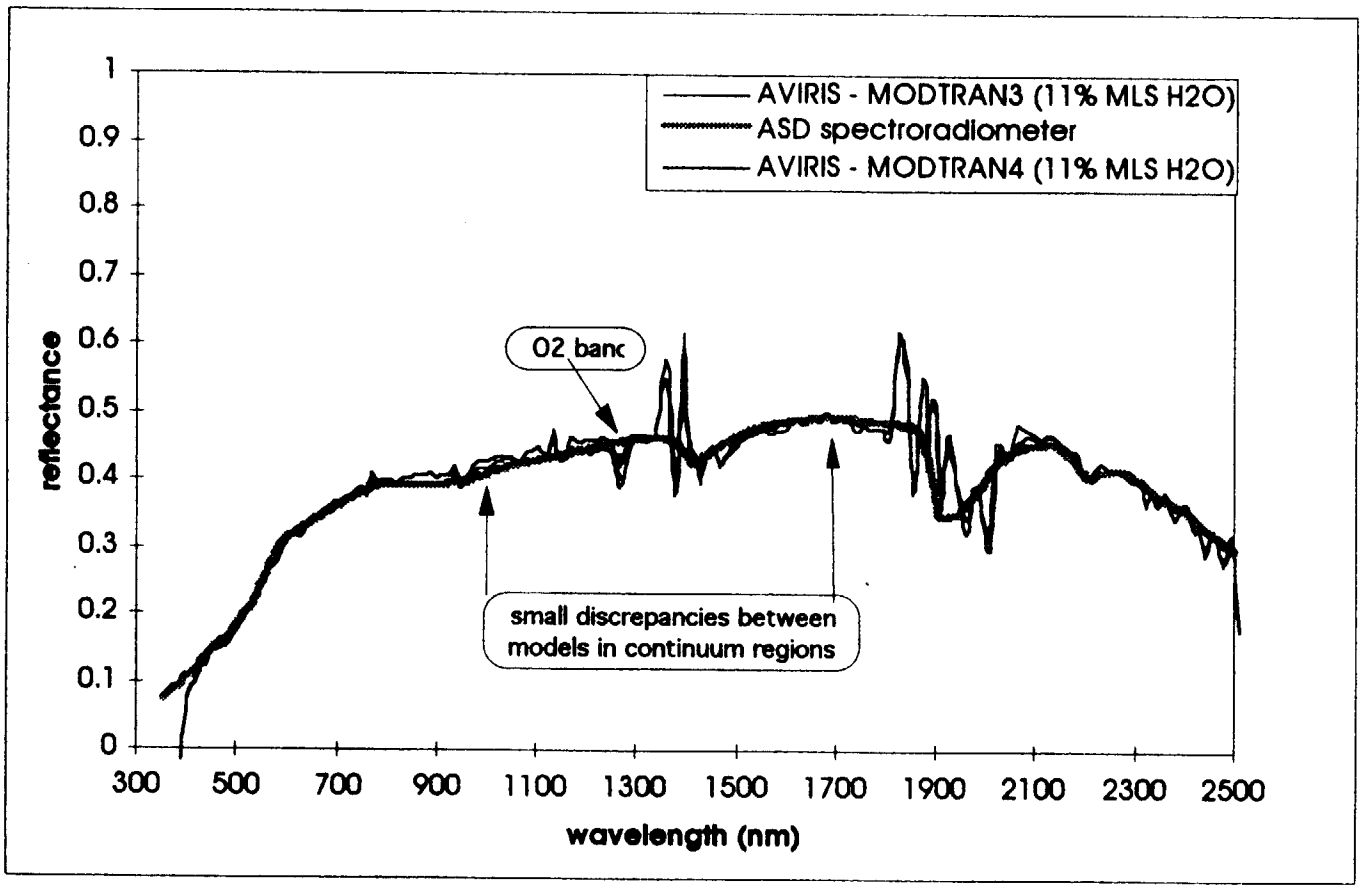
MODTRAN 3/4 comparison



conclusions

- AVIRIS calibration experiments: a method to test MODTRAN in the reflected solar spectrum
- v. 3 and 4 provide comparable results
  - small discrepancies in continuum regions and 1290nm O_2 band
- v. 4 a better fit to 1290nm O_2 band